

ABSTRACT

Electrochemical and gas phase hydrogen storage alloy compositions that provide superior performance, especially at low temperature, and excellent cycle life characteristics. The alloys of this invention are AB_5 type alloys that include a cycle life enhancement element and a low Co concentration. The preferred cycle life enhancement elements include Zr and Si. The cycle life enhancement elements increase the cycle life of the instant alloys by reducing the pulverization of alloy particles upon repeated cycles of charging-discharging or hydriding-dehydriding. The alloys are characterized by low hysteresis on cycling, where hysteresis is measured in terms of mass concentration difference, a parameter related to the activation energy associated with the incorporation of hydrogen into the alloy. The instant alloys are designed to have a low activation energy for hydrogen incorporation and as a result, provide low hysteresis and a more uniform concentration of absorbed hydrogen within the material. As a result, differential lattice expansion effects associated with the absorption of hydrogen are minimized and the tendency for particle pulverization on cycling is minimized. Alloys having a low Co concentration and long cycle life are thus provided for.